Advanced Concept Studies for Commercial Transports Entering Service in the 2030-35 Period

Subsonic Fixed Wing Perspective

Fundamental Aeronautics Pre-Proposal Conference
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Description of SFW Project

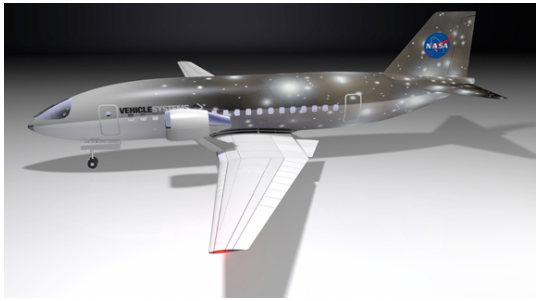
- ***Objectives***
  - Development of prediction and analysis tools for reduced uncertainty in design process
  - Development of concepts/technologies for enabling dramatic improvements in noise, emissions and performance characteristics of subsonic/transonic aircraft
- ***Relevance***
  - Direct impact on future designs of a wide range of subsonic aircraft relevant to industry, DoD, and OGA
  - Direct impact on JPDO & NextGen operational and environmental goals and objectives

System Level Metrics

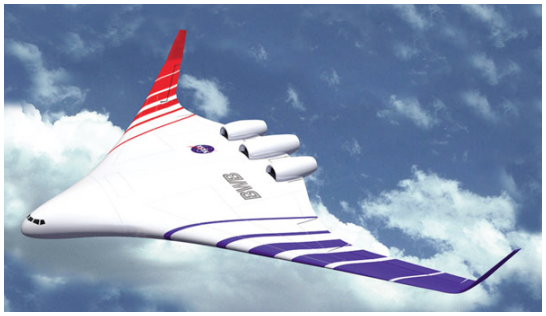
.... technology for dramatically improving noise, emissions, & performance

CORNERS OF THE TRADE SPACE	N+1 (2015 EIS) Generation Conventional Tube and Wing (relative to B737/CFM56)	N+2 (2020 IOC) Generation Unconventional Hybrid Wing Body (relative to B777/GE90)
Noise (cum below Stage 3)	- 42 dB	- 52 dB
LTO NOx Emissions (below CAEP 2)	-70%	-80%
Performance: Aircraft Fuel Burn	-33%***	-40%***
Performance: Field Length	-33%	-50%

N+1 Conventional



N+2 Hybrid Wing/Body



*** An additional reduction of 10 percent may be possible through improved operational capability

Approach

- *Enable Major Changes in Engine Cycle/Airframe Configurations*
- *Reduce Uncertainty in Multi-Disciplinary Design and Analysis Tools and Processes*
- *Develop/Test/ Analyze Advanced Multi-Discipline Based Concepts and Technologies*
- *Conduct Discipline-based Foundational Research*

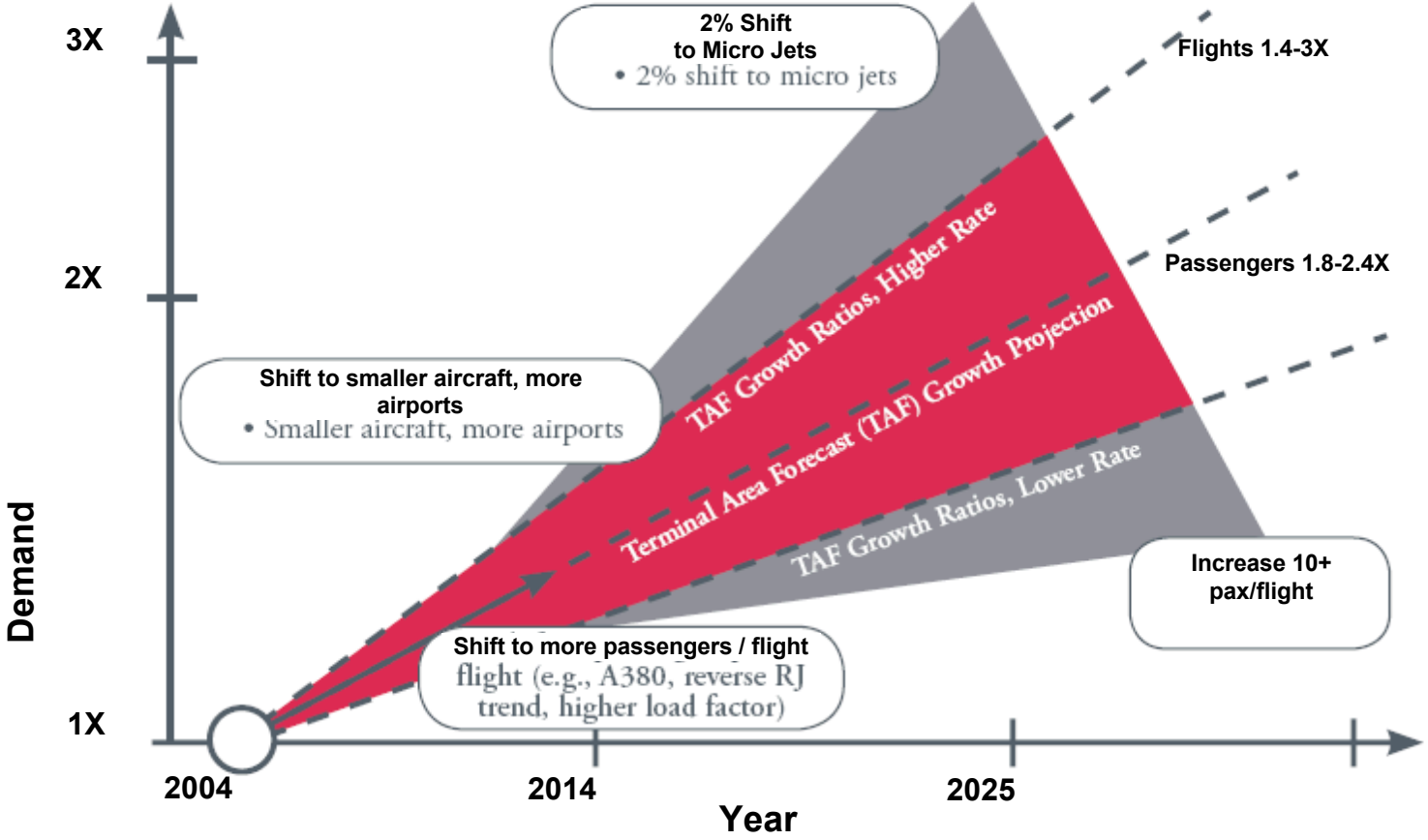
Projecting the Future

NextGen Vision

Provide environmental protection that allows sustained aviation growth

Key Factors

- Demand/Capacity
- Environment
- Energy



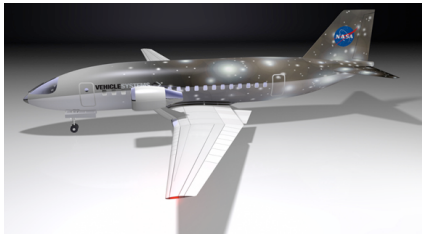
Source: NextGen Integrated Plan, 2004

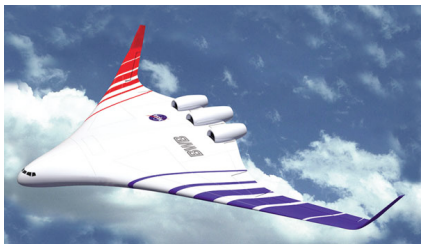
Subsonic Fixed Wing Project – "N+3" Advanced Concepts Studies

.... technology for dramatically improving noise, emissions, & performance

CORNERS OF THE TRADE SPACE	N+1 (2015 EIS) Generation Conventional Tube and Wing (relative to B737/CFM56)	N+2 (2020 IOC) Generation Unconventional Hybrid Wing Body (relative to B777/GE90)	N+3 (2030-2035 EIS) Advanced Aircraft Concepts (relative to B737/CFM56)
Noise (cum below Stage 3)	- 42 dB	- 52 dB	better than -81 dB (55 LDN at average boundary)
LTO NOx Emissions (below CAEP 2)	-70%	-80%	better than -80% plus mitigate formation of contrails
Performance: Aircraft Fuel Burn	-33%***	-40%***	better than -70% plus non-fossil fuel sources
Performance: Field Length	-33%	-50%	exploit metro-plex concepts

*** An additional reduction of 10 percent may be possible through improved operational capability





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Subsonic Fixed Wing Project – "N+3" Advanced Concepts Studies

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Scope of Study

- Describe challenges that may be facing passenger- and package-carrying commercial aircraft operators in 2030 timeframe
- Identify vehicle concepts and enabling technologies to address these challenges and N+3 system level metrics
  - Perform design space trade studies as needed
  - Identify pros/cons of advanced vehicle concepts
  - Detailed system study to evaluate concepts on equal basis
  - Quantify noise, emissions and performance characteristics
  - Assess environmental, economic and mobility impacts (fleet level)
- Recommend and prioritize concepts and enabling technologies
- Define follow-on technology development roadmaps
- Provide Contractor Report for public release

Key Points

- Commercial, Entry into service 2030-35 timeframe
- Vehicle-centric study
  - In context of your view of operational challenges for commercial operators in 2030+
  - What will be the most prevalent vehicle beyond 2030?
  - Cursory assessment of impact of vehicle introduction into fleet
- Enabling Technologies and Roadmaps

- CLEAN SHEET of PAPER
  - THINK OUTSIDE THE BOX